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Abstract

SMALL POWER REACTORS AND PORTABLE REACTOR POWER PLANTS

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The United States program in Small Power Reactors and Portable Reactor Power Plants, other than for space applications, is concentrated generally in the Army Reactors Program--a joint program of the Atomic Energy Commission and the Department of the Army.

The low power levels appropriate to the requirements (1-10 MWe) of this program plus the requirement for system portability introduce design limitations. The portability requirement means that the plant must be of minimum size and weight and be packaged in modules which can be carried in available transport aircraft. The possible utilization of these plants at remote sites of minimal accessibility requires that plant modules be preassembled and tested at the factory to reduce site installation effort and that plant installation not require extensive heavy construction equipment. This type of application also places heavy emphasis upon high plant availability and reliability of operation. Simplicity of plant operation is emphasized also by the necessity that the plant be operated by a small crew not possessing a high degree of specialized training.

Design characteristics typical of these plants are illustrated by the PM-1 located at Sundance, Wyoming, USA and the PM-3A at McMurdo Station, Antarctica. These totally self-sufficient plants producing 1-1.5 MWe can be transported in 18 air transportable packages of plant equipment and about 40 packages of support facilities and buildings. The PM-3A was fabricated and preassembled at the factory in 16 months, including operational test of the plant on non-nuclear heat. It was installed in a previously prepared site and taken critical 77 days after arrival with a total installation effort of 5 447 man-days.

Following test operation, both of these plants have characteristically been at power about 85% of the time adjusted for scheduled shutdowns. They can be routinely operated by a crew numbering about 16 men. Fuel cycle costs are estimated to be in the range of 20-35 mils/kwhr.

The design technology and operational experience being developed in this program is applicable to many non-military installations.